IN THE CLAIMS

1. (Previously Presented) An article comprising a machine readable medium that stores data representing a predetermined function, the predetermined function comprising:

dividing the source matrix into four 2x2 sub-matrices A, *B*, *C* and *D*;

calculating a plurality of sub-matrix products from the sub-matrices;

calculating a determinant of the source matrix *dS* to form a matrix determinant residue rd of the source matrix as rd=1/dS;

forming a partial, inverse sub-matrix of each sub-matrix using one or more of the matrix products and a determinant of each sub-matrix; and

calculating an inverse of each sub-matrix *iA*, *iB*, *iC*, and *iD*, utilizing each partial, inverse sub-matrix and determinant residue rd, such that an inverse of the source matrix *iS* is formed.

2. (Previously Presented) The article of claim 1, wherein dividing the source matrix S into the four 2x2 sub-matrices *A*, *B*, *C* and *D* is performed according to the following rule:

$$S = \begin{pmatrix} A & B \\ C & D \end{pmatrix}$$

to enable storage of each sub-matrix within a pair of SIMD registers.

3. (Previously Presented) The article of claim 1, wherein calculating the plurality of sub-matrix products further comprises:

calculating an intermediate sub-matrix product for each sub-matrix by computing the following matrix equations:

$$\tilde{D}C = \mathrm{adj}(D) \bullet C$$

$$\tilde{A}B = \mathrm{adj}(A) \bullet B$$

wherein the adj function refers to an adjoint matrix operation and the dot symbol • refers to a matrix multiplication operation; and

calculating a final sub-matrix product for each of the intermediate sub-matrix products by computing the following equations:

$$B\tilde{D}C = B \bullet \tilde{D}C$$

$$D\tilde{B}A = D \bullet \mathrm{adj}\left(\tilde{A}B\right)$$

$$A\tilde{C}D = A \bullet \mathrm{adj}\left(\tilde{D}C\right)$$

$$C\tilde{A}B = C \bullet \tilde{A}B.$$

4. (Previously Presented) The article of claim 1, wherein calculating the matrix determinant residue further comprises:

computing a determinant of each sub-matrix *dA, dB, dC* and *dD*;

calculating a trace value by computing a following equation:

$$t = \text{trace}\,(\tilde{A}B \bullet \tilde{D}C);$$

wherein a dot symbol • refers to a matrix multiplication operation; and

calculating a determinant of the source matrix dS by computing a following equation:

$$dS = dA * dD + dB * dC - t$$

wherein the symbol * refers to a scalar multiplication operation.

5. (Previously Presented) The article of claim 1, wherein forming partial-inverse sub-matrices further comprises:

performing matrix scaling of a determinant of each sub-matrix as *D*dA, C*dB, B*dC* and *A*dD*; and

computing a partial inverse for each sub-matrix according to the following matrix scaling equations:

$$pA = A * dD - B\tilde{D}C$$
$$pB = C * dB - D\tilde{B}A$$
$$pC = B * dC - A\tilde{C}D$$
$$pD = D * dA - C\tilde{A}B,$$

wherein *pA, pB, pC,* and *pD* reference partial, inverse sub-matrices, and the symbol * refers to a matrix scaling by a scalar operation.

6. (Previously Presented) The article of claim 1, wherein calculating an inverse of each sub-matrix further comprises:

calculating an adjoint value of each partial, inverse sub-matrix *pA, pB, pC,* and *pD*, according to the following rules:

$$iA = \text{adj}(pA),$$
$$iB = \text{adj}(pB),$$
$$iC = \text{adj}(pC),$$
$$iD = \text{adj}(pD),$$

wherein the adj() function refers to the adjoint matrix operation;

calculating a final sub-matrix inverse value according to the following equations:

$$iA = iA * rd$$
$$iB = iB * rd$$
$$iC = iC * rd$$
$$iD = iD * rd,$$

wherein the symbol * refers to a matrix scaling by a scalar operation; and

forming the inverse source matrix iS according to the following rule:

$$iS = \begin{pmatrix} iA & iB \\ iC & iD \end{pmatrix}.$$

7. (Previously Presented) An article comprising a machine readable medium that stores data representing a predetermined function, the predetermined function comprising:

dividing a source matrix into four 2x2 sub-matrices, A, B, C and D;

calculating one or more intermediate sub-matrix products from one or more of the sub-matrices;

calculating a determinant of the source matrix to form a determinant residue rd utilizing the intermediate sub-matrix products;

scaling a determinant of each sub-matrix and the intermediate sub-matrix products using determinant residue rd to form final sub-matrix products;

forming a partial inverse sub-matrix pA, pB, pC and pD for each sub-matrix using the scaled sub-matrix determinants and the final sub-matrix products; and

calculating an inverse of each sub-matrix iA, iB, iC and iD, utilizing each partial inverse sub-matrix to form an inverse source matrix iS.

8. (Previously Presented) The article of claim 7, wherein calculating the matrix determinant residue further comprises:

computing a determinant of each sub-matrix dA, dB, dC and dD;

calculating a trace value by computing a following equation:

$$t = \text{trace}\,(\tilde{A}B \bullet \tilde{D}C);$$

wherein a dot symbol • refers to a matrix multiplication operation;

calculating a determinant of the source matrix dS by computing a following equation:

$$dS = dA * dD + dB * dC - t$$

wherein the symbol * refers to a scalar multiplication operation; and

calculating the determinant residue rd according to the following rule:

$$rd = 1/dS.$$

9. (Previously Presented) The article of claim 7, wherein scaling by the determinant residue further comprises:

multiplying each determinant by the determinant residue *rd* according to the following rules:

$$dA = dA * rd$$
$$dB = dB * rd$$
$$dC = dC * rd$$
$$dD = dD * rd;$$

multiplying each intermediate sub-matrix product $\tilde{A}B$ and $\tilde{D}C$ by the determinant residue rd, according to the following equations:

$$\tilde{D}C = \tilde{D}C * rd$$
$$\tilde{A}B = \tilde{A}B * rd; \text{ and}$$

calculating a final sub-matrix product for each of the intermediate matrix products by computing the following equations:

$$B\tilde{D}C = B \bullet \tilde{D}C$$
$$D\tilde{B}A = D \bullet \mathrm{adj}(\tilde{A}B)$$
$$A\tilde{C}D = A \bullet \mathrm{adj}(\tilde{D}C)$$
$$C\tilde{A}B = C \bullet \tilde{A}B.$$

10. (Previously Presented) The article of claim 7, wherein calculating an inverse of each sub-matrix further comprises:

generating an adjoint of each partial, inverse sub-matrix by computing the following equations:

$$iA = \mathrm{adj}(pA)$$
$$iB = \mathrm{adj}(pB)$$
$$iC = \mathrm{adj}(pC)$$
$$iD = \mathrm{adj}(pD); \text{ and}$$

forming the inverse source matrix *iS* according to the following rule:

$$iS = \begin{pmatrix} iA & iB \\ iC & iD \end{pmatrix}.$$

11. (Original) A computer readable storage medium including program instructions that direct a computer to function in a specified manner when executed by a processor, the program instructions comprising:

dividing the source matrix into four 2x2 sub-matrices A, B, C and D;

calculating a plurality of sub-matrix products from the sub-matrices;

calculating a determinant of the source matrix *dS* to form a matrix determinant residue rd of the source matrix as *rd=1/dS*;

forming a partial, inverse sub-matrix of each sub-matrix using one or more of the matrix products and a determinant of each sub-matrix; and

calculating an inverse of each sub-matrix *iA, iB, iC,* and *iD*, utilizing each partial, inverse sub-matrix and determinant residue rd, such that an inverse of the source matrix *iS* is formed.

12. (Original) The computer readable storage medium of claim 11, wherein dividing the source matrix S into the four 2x2 sub-matrices *A, B, C* and *D* is performed according to the following rule:

$$S = \begin{pmatrix} A & B \\ C & D \end{pmatrix}$$

to enable storage of each sub-matrix within a pair of SIMD registers.

13. (Original) The computer readable storage medium of claim 11, wherein calculating the plurality of sub-matrix products further comprises:

calculating an intermediate sub-matrix product for each sub-matrix by computing the following matrix equations:

$$\tilde{D}C = \operatorname{adj}\left(\tilde{D}\right) \bullet C$$

$$\tilde{A}B = \operatorname{adj}(A) \bullet B$$

wherein the adj() function refers to an adjoint matrix operation and the dot symbol • refers to a matrix multiplication operation; and

calculating a final sub-matrix product for each of the intermediate sub-matrix products by computing the following equations:

$$B\tilde{D}C = B \bullet \tilde{D}C$$

$$D\tilde{B}A = D \bullet \operatorname{adj}\left(\tilde{A}B\right)$$

$$A\tilde{C}D = A \bullet \operatorname{adj}\left(\tilde{D}C\right)$$

$$C\tilde{A}B = C \bullet \tilde{A}B.$$

14. (Original) The computer readable storage medium of claim 11, wherein calculating the matrix determinant residue further comprises:

computing a determinant of each sub-matrix *dA, dB, dC* and *dD*;

calculating a trace value by computing a following equation:

$$t = \text{trace}(\tilde{A}B \bullet \tilde{D}C);$$

wherein a dot symbol • refers to a matrix multiplication operation; and

calculating a determinant of the source matrix dS by computing a following equation:

$$dS = dA * dD + dB * dC - t$$

wherein the symbol * refers to a scalar multiplication operation.

15. (Original) The computer readable storage medium of claim 11, wherein forming partial-inverse sub-matrices further comprises:

performing matrix scaling of a determinant of each sub-matrix as $D*dA$, $C*dB$, $B*dC$ and $A*dD$; and

computing a partial inverse for each sub-matrix according to the following matrix scaling equations:

$$pA = A * dD - \tilde{B}DC$$
$$pB = C * dB - \tilde{D}BA$$
$$pC = B * dC - \tilde{A}CD$$
$$pD = D * dA - \tilde{C}AB,$$

wherein pA, pB, pC, and pD reference partial, inverse sub-matrices, and the symbol * refers to a matrix scaling by a scalar operation.

16. (Original) The computer readable storage medium of claim 11, wherein calculating an inverse of each sub-matrix further comprises:

calculating an adjoint value of each partial, inverse sub-matrix pA, pB, pC, and pD, according to the following rules:

$$iA = \text{adj}(pA),$$
$$iB = \text{adj}(pB),$$
$$iC = \text{adj}(pC),$$
$$iD = \text{adj}(pD),$$

wherein the adj() function refers to the adjoint matrix operation;

calculating a final sub-matrix inverse value according to the following equations:

$$iA = iA * rd$$
$$iB = iB * rd$$
$$iC = iC * rd$$
$$iD = iD * rd,$$

wherein the symbol * refers to a matrix scaling by a scalar operation; and

forming the inverse source matrix *iS* according to the following rule:

$$iS = \begin{pmatrix} iA & iB \\ iC & iD \end{pmatrix}.$$

17. (Original) The computer readable storage medium including program instructions that direct a computer to function in a specified manner when executed by a processor, the program instructions comprising:

dividing a source matrix into four 2x2 sub-matrices, *A, B, C* and *D*;

calculating one or more intermediate sub-matrix products from one or more of the sub-matrices;

calculating a determinant of the source matrix *dS* to form a determinant residue rd of the source matrix utilizing the intermediate sub-matrix products and the sub-matrix determinants;

scaling a determinant of each sub-matrix and the intermediate sub-matrix products using determinant residue rd to form final sub-matrix products;

forming a partial inverse sub-matrix *pA, pB, pC* and *pD* for each sub-matrix using the scaled sub-matrix determinants and the final sub-matrix products; and

calculating an inverse of each sub-matrix *iA, iB, iC* and *iD*, utilizing each partial inverse sub-matrix to form an inverse source matrix *iS*.

18. (Original) The computer readable storage medium of claim 17, wherein calculating the matrix determinant residue further comprises:

computing a determinant of each sub-matrix *dA, dB, dC* and *dD*;

calculating a trace value by computing a following equation:

$$t = \text{trace}\,(\tilde{A}B \bullet \tilde{D}C);$$

wherein a dot symbol • refers to a matrix multiplication operation;

calculating a determinant of the source matrix dS by computing a following equation:

$$dS = dA * dD + dB * dC - t$$

wherein the symbol * refers to a scalar multiplication operation; and

calculating the determinant residue rd according to the following rule:

$$rd = 1/dS.$$

19. (Original) The computer readable storage medium of claim 17, wherein scaling by the determinant residue further comprises:

multiplying each determinant by the determinant residue *rd* according to the following rules:

$$dA = dA * rd$$
$$dB = dB * rd$$
$$dC = dC * rd$$
$$dD = dD * rd;$$

multiplying each intermediate sub-matrix product by the determinant residue rd, according to the following equations:

$$\tilde{D}C = \tilde{D}C * rd$$
$$\tilde{A}B = \tilde{A}B * rd; \text{ and}$$

calculating a final sub-matrix product for each of the intermediate matrix products by computing the following equations:

$$B\tilde{D}C = B \bullet \tilde{D}C$$
$$D\tilde{B}A = D \bullet \operatorname{adj}(\tilde{A}B)$$
$$A\tilde{C}D = A \bullet \operatorname{adj}(\tilde{D}C)$$
$$C\tilde{A}B = C \bullet \tilde{A}B.$$

20. (Original) The computer readable storage medium of claim 17, wherein calculating an inverse of each sub-matrix further comprises:

generating an adjoint of each partial, inverse sub-matrix by computing the following equations:

$$iA = \operatorname{adj}(pA)$$
$$iB = \operatorname{adj}(pB)$$
$$iC = \operatorname{adj}(pC)$$
$$iD = \operatorname{adj}(pD); \text{ and}$$

forming the inverse source matrix *iS* according to the following rule:

$$iS = \begin{pmatrix} iA & iB \\ iC & iD \end{pmatrix}.$$

21. (Previously Presented) An apparatus, comprising:

a processor having circuitry to execute instructions;

a plurality of SIMD data storage devices coupled to the processor, the SIMD data storage registers to store pairs of floating point vectors during matrix calculation;

a storage device coupled to the processor, having sequences of instructions stored therein, which when executed by the processor cause the processor to:

divide the source matrix into four 2x2 sub-matrices *A, B, C* and *D*;

calculate a plurality of sub-matrix products from the sub-matrices;

calculate a determinant of the source matrix *dS* to form a determinant residue rd of the source matrix as $rd=1/dS$;

form a partial, inverse sub-matrix of each sub-matrix using one or more of the matrix products and the determinant of each sub-matrix; and

calculate an inverse of each sub-matrix *iA, iB, iC,* and *iD*, utilizing each partial, inverse sub-matrix and determinant residue rd, such that an inverse of the source matrix *iS* is formed.

22. (Original) The apparatus of claim 21, wherein the instruction to calculate the plurality of sub-matrix products further causes the processor to:

calculate an intermediate sub-matrix product for each sub-matrix by computing the following matrix equations:

$$\tilde{D}C = \mathrm{adj}\left(\tilde{D}\right) \bullet C$$

$$\tilde{A}B = \mathrm{adj}(A) \bullet B$$

wherein the adj() function refers to an adjoint matrix operation and the dot symbol • refers to a matrix multiplication operation; and

calculate a final sub-matrix product for each of the intermediate sub-matrix products by computing the following equations:

$$B\tilde{D}C = B \bullet \tilde{D}C$$

$$D\tilde{B}A = D \bullet \mathrm{adj}\left(\tilde{A}B\right)$$

$$A\tilde{C}D = A \bullet \mathrm{adj}\left(\tilde{D}C\right)$$

$$C\tilde{A}B = C \bullet \tilde{A}B.$$

23. (Original) The apparatus of claim 21, wherein the instruction to calculate the matrix determinant residue further causes the processor to:

compute a determinant of each sub-matrix *dA, dB, dC* and *dD*;

calculate a trace value by computing a following equation:

$$t = \text{trace}\,(\tilde{A}B \bullet \tilde{D}C);$$

wherein a dot symbol • refers to a matrix multiplication operation; and

calculate a determinant of the source matrix dS by computing a following equation:

$$dS = dA * dD + dB * dC - t$$

wherein the symbol * refers to a scalar multiplication operation.

24. (Original) The apparatus of claim 21, wherein the instruction to perform matrix scaling further causes the processor to:

perform matrix scaling of a determinant of each sub-matrix as $D*dA$, $C*dB$, $B*dC$ and $A*DdD$;

compute a partial inverse for each sub-matrix according to the following matrix scaling equations:

$$pA = A * dD - B\tilde{D}C$$

$$pB = C * dB - D\tilde{B}A$$

$$pC = B * dC - A\tilde{C}D$$

$$pD = D * dA - C\tilde{A}B,$$

wherein pA, pB, pC, and pD reference partial, inverse sub-matrices and the symbol * refers to a matrix scaling by a scalar operation.

25. (Original) The apparatus of claim 21, wherein the instruction to calculate an inverse of each sub-matrix further causes the processor to:

calculate an adjoint value of each partial, inverse sub-matrix pA, pB, pC, and pD, according to the following rules:

$$iA = \text{adj}(pA),$$

$$iB = \text{adj}(pB),$$

$$iC = \text{adj}(pC),$$

$$iD = \text{adj}(pD),$$

wherein the adj() function refers to the adjoint matrix operation;

calculate a final sub-matrix inverse value according to the following equations:

$$iA = iA * rd$$
$$iB = iB * rd$$
$$iC = iC * rd$$
$$iD = iD * rd,$$

wherein the symbol * refers to a matrix scaling by a scalar operation; and

form the inverse source matrix iS according to the following rule:

$$iS = \begin{pmatrix} iA & iB \\ iC & iD \end{pmatrix}.$$

26. (Currently Amended) ~~An apparatus~~A system, comprising:

a processor having circuitry to execute instructions;

a plurality of SIMD data storage devices coupled to the processor, the SIMD data storage registers to pairs of floating point vectors during matrix calculation;

a storage device coupled to the processor, having sequences of instructions stored therein, which when executed by the processor cause the processor to:

divide a source matrix into four 2x2 sub-matrices, A, B, C and D;

calculate one or more intermediate sub-matrix products from each of the sub-matrices,

calculate a source matrix dS to form a determinant residue rd utilizing the intermediate sub-matrix products,

scale a determinant of each sub-matrix and the intermediate sub-matrix products using determinant residue rd to form final sub-matrix products,

form a partial inverse sub-matrix pA, pB, pC and pD for each sub-matrix using the scaled sub-matrix determinants and the final sub-matrix products, and

calculate an inverse of each sub-matrix iA, iB, iC and iD, utilizing each partial inverse sub-matrix to form an inverse source matrix iS.

27. (Previously Presented) The system of claim 26, wherein the instruction to calculate the source matrix determinant residue further causes the processor to:

compute a determinant of each sub-matrix dA, dB, dC and dD;

calculate a trace value by computing a following equation:

$$t = \text{trace}\,(\tilde{A}B \bullet \tilde{D}C)$$

wherein a dot symbol • refers to a matrix multiplication operation;

calculate a determinant of the source matrix dS by computing a following equation:

$$dS = dA * dD + dB * dC - t$$

wherein the symbol * refers to a scalar multiplication operation; and

calculate the determinant residue rd according to the following rule:

$$rd = 1/dS.$$

28. (Previously Presented) The system of claim 26, wherein the instruction to scale by the determinant residue further causes the processor to:

multiply each determinant by the determinant residue *rd* according to the following rules:

$$dA = dA * rd$$
$$dB = dB * rd$$
$$dC = dC * rd$$
$$dD = dD * rd;$$

multiply each intermediate sub-matrix product $\tilde{A}B$ and $\tilde{D}C$ by the determinant residue rd, according to the following equations:

$$\tilde{D}C = \tilde{D}C * rd$$
$$\tilde{A}B = \tilde{A}B * rd; \text{ and}$$

calculate a final sub-matrix product for each of the intermediate matrix products by computing the following equations:

$$B\tilde{D}C = B \bullet \tilde{D}C$$
$$D\tilde{B}A = D \bullet \mathrm{adj}(\tilde{A}B)$$
$$A\tilde{C}D = A \bullet \mathrm{adj}(\tilde{D}C)$$
$$C\tilde{A}B = C \bullet \tilde{A}B.$$

29. (Previously Presented) The system of claim 26, wherein the instruction to calculate an inverse of each sub-matrix further causes the processor to:

generate an adjoint of each partial, inverse sub-matrix by computing the following equations:

$$iA = \mathrm{adj}(pA)$$
$$iB = \mathrm{adj}(pB)$$
$$iC = \mathrm{adj}(pC)$$
$$iD = \mathrm{adj}(pD); \text{ and}$$

form the inverse source matrix *iS* according to the following rule:

$$iS = \begin{pmatrix} iA & iB \\ iC & iD \end{pmatrix}.$$

30. (Previously Presented) A method comprising:

dividing a source matrix into four 2x2 sub-matrices A, B, C and D;

storing each two element row of each 2x2 sub-matrix within a single instruction multiple data (SIMD) register;

forming a partial, inverse sub-matrix of each sub-matrix using one or more of a plurality of sub-matrix products calculated from the sub-matrices and a determinant of each sub-matrix within one or more SIMD registers; and

calculating an inverse of each sub-matrix *iA*, *iB*, *iC* and *iD*, utilizing each partial, inverse sub-matrix and a determinant residue rd calculated from the source matrix, such that an inverse of the source matrix *iS* is formed within the one or more SIMD registers.

31. (Previously Presented) The method of claim 30, wherein forming the partial inverse sub-matrix further comprises:

calculating the plurality of sub-matrix products from the sub-matrices; and

calculating the determinant of the source matrix *Ds* to form the matrix determinant residue rd of the source matrix as rd=1/Ds.

32. (Previously Presented) The method of claim 30, wherein dividing the source matrix S into the four 2x2 sub-matrices *A, B, C* and *D* is performed according to the following rule:

$$S = \begin{pmatrix} A & B \\ C & D \end{pmatrix}$$

to enable storage of each sub-matrix within a pair of SIMD registers.

33. (Previously Presented) The method of claim 31, wherein calculating an inverse of each sub-matrix further comprises:

calculating an adjoint value of each partial, inverse sub-matrix *pA, pB, pC,* and *pD*, according to the following rules:

$$iA = \text{adj}(pA),$$
$$iB = \text{adj}(pB),$$
$$iC = \text{adj}(pC),$$
$$iD = \text{adj}(pD),$$

wherein the adj() function refers to the adjoint matrix operation;

calculating a final sub-matrix inverse value according to the following equations:

$$iA = iA * rd$$
$$iB = iB * rd$$
$$iC = iC * rd$$
$$iD = iD * rd,$$

wherein the symbol * refers to a matrix scaling by a scalar operation; and forming the inverse source matrix *iS* according to the following rule:

$$iS = \begin{pmatrix} iA & iB \\ iC & iD \end{pmatrix}.$$